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TORTOISES AND TURTLES

Balkan Terrapin

Mauremys rivulata

Mauremys rivulata is a medium-sized, diurnal freshwater turtle from the Balkans and the eastern Mediterranean region. Females reach a shell length of about 24 cm, males about 19 cm. The species is hardy and tolerates many kinds of water, but needs a large, filtered aquatic set-up with a warm basking spot and UVB. In summer it can be kept outdoors in a secure pond.

Family: Geoemydidae Former name: *Mauremys caspica rivulata; Emys rivulata*

KEY FACTS

THE ANIMAL

Adult size	**15-24 cm** total length incl. tail
Lifespan	**20-30 years**
Active	**By day**
Lifestyle	**Semi-aquatic**
Habitat	**Wetland**
Difficulty	**Intermediate**

CARE

Min. enclosure	**120 × 60 × 65 cm** L × W × H for 1 adult
Temperature, day	**24-29 °C**
Basking spot	**30-35 °C**
Temperature, night	**20-24 °C**
Humidity	**50-70%**
Water	**Aquaterrarium** depth 25-40 cm
Water temperature	**21-27 °C**
UVB	**Essential** Ferguson zone 3
Diet	**Insects, complete diet, plants, vertebrates and worms/snails**
Kept	**Singly or in pairs**

BREEDING

Reproduction	**Egg-laying**
Clutch size	**4-10 eggs**
Clutches per year	**2-3**
Incubation	**49-77 days** at 27-30 °C

PROTECTION AND PAPERWORK

CITES	**Not listed**
EU annex	**Not listed**
IUCN	**Not Evaluated (NE)**

About the species

Mauremys rivulata is a medium-sized freshwater turtle that spends most of its life in the water, but basks on banks and floating objects. All measurements in the text are shell length (carapace). Females grow to about 24 cm, males to about 19 cm. The shell is flat and slightly domed with a distinct keel along the middle, which is strongest in young animals and often almost disappears in adults. Adults are usually plain brown or olive green with faint or no markings. Young animals have reddish-brown or yellowish, irregular net-like patterns on the shell. The plastron is dark to black in young animals and lightens with age, and the bridge between carapace and plastron is dark. The snout and neck have thin stripes, which can be missing altogether. The forelimbs have five claws, the hind limbs four.

The male is flatter than the female and has a slightly concave plastron and a longer tail with a broader base. Newly hatched young measure 3-4 cm.

The species was formerly regarded as a subspecies of *Mauremys caspica*. Genetic studies have confirmed that these are two species, each living in its own area and hybridising only very rarely where they meet in north-western Turkey and near the border between Turkey and Syria. The colour of the bridge and the markings on the hind limbs distinguish them: *M. rivulata* has a dark bridge and no yellow cross stripes on the hind limbs. In the trade the species may still appear under the older name *M. caspica rivulata*.

The species is hardy and tolerates many types of water, and the genus is intelligent and inquisitive. Lifespan in captivity is not known for the species; 20-30 years is an estimate for a freshwater turtle of this size.

Distribution and habitat

Mauremys rivulata is found in the Balkans and the eastern Mediterranean region: from the coast of Croatia, Serbia, Montenegro and Albania through most of Greece (including Crete, Corfu, Lesbos, Limnos and Kos), south-eastern North Macedonia and southern Bulgaria to the Sea of Marmara, on across Cyprus and western and southern Turkey to Syria, Lebanon, north-western Jordan, northern and central Israel and the West Bank. The occurrence in Bosnia and Herzegovina is not confirmed and is not shown on the map.

The range follows the warm Mediterranean climate. The species is absent from mountainous and dry areas in the southern part of the region. In the east it adjoins *M. caspica*, and the two species are largely separated geographically.

> **Native range:** Albania, Bulgaria, Croatia, Cyprus, Greece, Israel, Palestinian Territories, Jordan, Lebanon, North Macedonia, Montenegro, Serbia, Syria and Turkey.

HABITAT

Mauremys rivulata lives in many kinds of fresh water: rivers and streams with weak current, seasonal ponds, lakes, brackish coastal lagoons, drainage ditches, irrigation canals and reservoirs. It is rarely found in fast-flowing water. It tolerates acidic, alkaline, polluted and brackish water and can occur at very high densities. It also tolerates seawater, so straits and open sea are no significant obstacle to its dispersal.

Young animals stay in shallow, muddy water with plenty of vegetation, where they are best protected. Adults are more often seen in deeper, clearer water. The animals bask on banks and floating objects and dive quickly into the vegetation or mud when disturbed.

The species does not eat when the water is colder than about 13 °C or warmer than about 30 °C, and at air temperatures above 36 °C the animals are seen floating just below the surface to avoid overheating. If the ponds dry out in summer, the animals dig in and survive aestivation, or they migrate to other water. In the northern parts of the range the animals hibernate. In the temperate regions mating takes place from November to April with a peak in January-February, and egg laying occurs from May to the end of July.

Care

THE ENCLOSURE

Keep the animal in a large aquatic set-up, a tub or a secure pond, not in an ordinary terrarium. Care of *Mauremys rivulata* is only sparsely described, so temperatures, lighting, feeding and husbandry here are based on the closely related *Mauremys reevesii* and the other *Mauremys* species from the Mediterranean.

The tank must be at least five times as long as the shell of the largest animal and half as wide as it is long, with the land area counted as part of the floor area. The water must be at least twice as deep as the shell is wide. A female of 24 cm thus needs at least 120 × 60 cm and a male of 19 cm 100 × 50 cm. The dimensions in the data box, 120 × 60 × 65 cm, give a water section of 80 × 60 cm with 40 cm of water (just under 200 litres), a land section of 40 × 60 cm and a 25 cm rim above the water. Each additional adult requires more space and more basking spots. Larger is always better.

Water is heavy: 200 litres weighs 200 kg, so place the set-up on a floor that can bear it. The land section must be large enough for the whole animal to get completely out of the water and dry off. Build it as a shelf or a beach with a rough ramp, so that the animal can crawl up instead of swimming up to the surface. Natural stone, roots and ready-made floating platforms are suitable. Young animals swim less well than adults and need lower water and easy ways up.

The water is cleaned by a powerful external filter that filters both mechanically and biologically. In large tubs and ponds a koi-type filter with layers of foam and a pump works well, preferably with a UV-C unit, which keeps algae growth and infection pressure down. In summer an outdoor pond is best, if it is secured against escape and predators with fencing into the ground and netting over the top. Never release the animal into the wild.

TEMPERATURE

The water should be 21-27 °C. The air above the water should be 24-29 °C, and the surface of the basking spot should reach 30-35 °C, measured with an infrared thermometer. At night the air may fall to 20-24 °C, and in winter somewhat more. Warm the basking spot with a halogen lamp in a deep dome with a ceramic socket, and put the water heater behind a plastic guard, so that the animal does not burn itself, and with an automatic shut-off.

In the wild the species eats only at water temperatures from about 13 to about 30 °C, and at air temperatures above 36 °C it risks overheating. There must therefore be both warm and cool places in the set-up.

Hibernation is natural in the northern part of the range, but artificial hibernation is not necessary in captivity: the animal adapts to the small seasonal changes in temperature and light. If you nevertheless wish to give the animal a hibernation, first talk to a vet with reptile experience.

Read more: Heat and temperature Read more: Brumation and the seasons

HUMIDITY AND WATER

The turtle's humidity is the water itself. The relative humidity of the air is not documented for the species, and 50-70 % in the room is an estimate. What matters is the cleanliness of the water: the animal passes droppings and food remains in the water, so it quickly becomes dirty.

Use a powerful filter, remove food remains with a net after feeding, and change part of the water regularly. Use chlorine-free water, for example treated with a water conditioner. In the wild the species tolerates polluted and brackish water, but that is no reason to exploit it in captivity.

Read more: Humidity, misting and ventilation

WATER AND WATER QUALITY

The water is the animal's living space, so it must be deep, clean and warm. The water must be at least twice as deep as the shell is wide, and 25-40 cm suits adults; juveniles need lower water. The temperature is 21-27 °C (see Temperature). The depth must allow room to swim freely and turn around, but the animal must always have an easy way up to the surface.

The filter must filter both mechanically and biologically. The mechanical part removes food remains and droppings; the biological part, with foam or ceramic rings, houses bacteria that break down toxic nitrogen waste. Choose an external canister filter rated for at least 2-3 times the water volume. Clean the filter regularly, and rinse the filter media in water from the tub, not from the tap, so that the bacteria are preserved. Connect all electrical equipment near the water to a residual-current device (RCD), and unplug with dry hands before touching the filter.

LIGHTING AND UVB

UVB is a necessity: it enables the animal to produce vitamin D3, absorb calcium and develop a healthy shell. The Ferguson zone is not documented for the species; zone 3 is an estimate based on the fact that the species basks a great deal. Use a T5 HO tube with a reflector over the basking spot. The distance from the tube to the animal's back follows the tube's instructions; there must be no glass or plastic between tube and animal, and UVB tubes lose strength and must be replaced regularly.

The basking spot also dries the skin and shell, so that shedding proceeds normally, and it dislodges parasites. If the basking spot is missing, it can cause skin infections, shell rot and ear abscesses. The light should be on about 12 hours a day. Direct sunlight is best, but requires shade, so that the animal does not overheat.

Read more: Lighting and UVB Read more: Calcium, vitamins and supplements

FEEDING

Mauremys rivulata is omnivorous. In the wild, young animals are predominantly carnivorous, while adults eat more plants. The food includes aquatic plants, filamentous algae, insect larvae, worms, snails, crustaceans, tadpoles and small fish as well as carrion. The species eats under water; throw the food into the tub.

Give quality pellets for aquatic turtles as a base, with about 30-40 % protein, under 20 % fat and a calcium to phosphorus ratio of at least 2:1. Supplement with earthworms, farmed snails, insects, pieces of fish and leafy greens such as endive, escarole, romaine lettuce and kale. Feeding 3 days a week suits adults; more frequent feeding causes too rapid growth and poorer water quality.

Supplements of calcium and vitamins are quickly washed off in water. Work them into food that has been soaked in a solution, or sprinkle them on food that is given outside the tub. Remove food remains after feeding.

Read more: Rearing tadpoles

BEHAVIOUR AND HANDLING

Mauremys rivulata is diurnal and shy: it dives lightning fast when disturbed. The genus is intelligent and learns to associate you with food. The animal does not like being handled. Hold it firmly under the shell with both hands, and wash your hands thoroughly afterwards. The genus can give off a foul-smelling fluid when animals are picked up.

As a rule the animal is kept alone. Two animals can be kept together if there is enough space and basking spots for both. Females can get severe bites to the face and neck during mating, so they must be monitored. Males can be aggressive towards each other. An animal that constantly swims along the glass often has too little space.

Breeding

SEXUAL MATURITY AND SEXING

The male is flatter than the female, has a slightly concave plastron and a longer tail with a broader base. The male is smaller than the female: up to about 19 cm against about 24 cm. Age and size at sexual maturity are not known. The sex ratio in the wild is about 1:1.

MATING

Mating normally takes place in the water and in rare cases can occur on land. The female can get severe bites to the face and neck, so the pair must be monitored, and there must be room for the female to get away. In the temperate regions the animals are sexually active from November to April with a peak in January-February; in colder areas mating comes later. How the season proceeds in captivity is not known.

EGG-LAYING AND CLUTCHES

The female lays 4-10 eggs per clutch, about 22 × 36 mm, and 2-3 clutches per season depending on the climate. In the wild she lays from May to the end of July in sand or soft soil near water. A female must have a box of sand or soil on the land section, so that she can dig a nest. If there is nowhere to lay, she can become egg-bound and must go to a vet.

INCUBATION

In the wild the eggs hatch after 49-77 days, that is 7-11 weeks. For artificial incubation 27-30 °C and 75-90 % humidity are suitable, at which the eggs hatch after 65-75 days; the figures are borrowed from the related *Mauremys caspica* and *Mauremys leprosa*. Whether the sex depends on incubation temperature is not known for the species.

Read more: Incubating eggs

REARING THE YOUNG

The young are 3-4 cm at hatching. In the wild they stay in shallow, muddy, planted water and are primarily carnivorous; they live on insect larvae and other small animals. Keep juveniles in shallow water with a gentle ramp and plenty of plants or hides. The water temperature for juveniles is not known; the adults' 21-27 °C suits. Keep juveniles separate from adults, and make sure that all get food.

Health and common mistakes

Turtles hide illness, so watch for changes. Weigh and measure the animal regularly, and keep a log of weight, appetite and behaviour. Sudden weight loss is often the first sign of illness.

Typical problems and mistakes in care: - Dirty water: the water quickly becomes a health risk if the filter is too weak or the water is not changed. - Lack of UVB or calcium, which causes a soft, deformed shell and bone disease. - Lack of a basking spot, which causes skin infections, shell rot and ear abscesses. - Feeding too often, which causes too rapid growth and poor water

quality. - Wrong set-up, where the animal cannot get out of the water.

All reptiles can be symptom-free carriers of *Salmonella* and infect humans. Wash your hands before and after contact with the animal, water and equipment. After a bite, rinse the wound under running water and clean it with mild soap.

See a vet with reptile experience if the animal loses weight, does not eat, has its mouth open or seems lethargic.

Read more: Quarantine and hygiene

Always ask someone who knows

This guide is a good place to start, but it cannot replace experience. Animals differ, and much of what matters most is learned from people who have kept the species for years. Talk to a breeder, an experienced keeper or a vet who knows reptiles and amphibians before you get the animal - and again if anything looks wrong.